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ABSTRACT

This seminar paper reports case studies in the successful use of adult social reinforcement to modify problem behaviors of individual children in the Laboratory Preschool at the University of Washington, Seattle. After initially determining that teacher behavior functioned as a reinforcer in accordance with reinforcement principles, it became possible to study the effects of adult attention on behavior deficits such as excessive crying, extreme passivity, excessive isolate behavior, lack of speech, and hyperactivity. Through text and tables, a brief description of the reinforcement program for each of nine "problem" children is presented. Collectively, the case studies demonstrate the effectiveness of adult social reinforcement as a tool for helping children modify behaviors that handicap them. WY)

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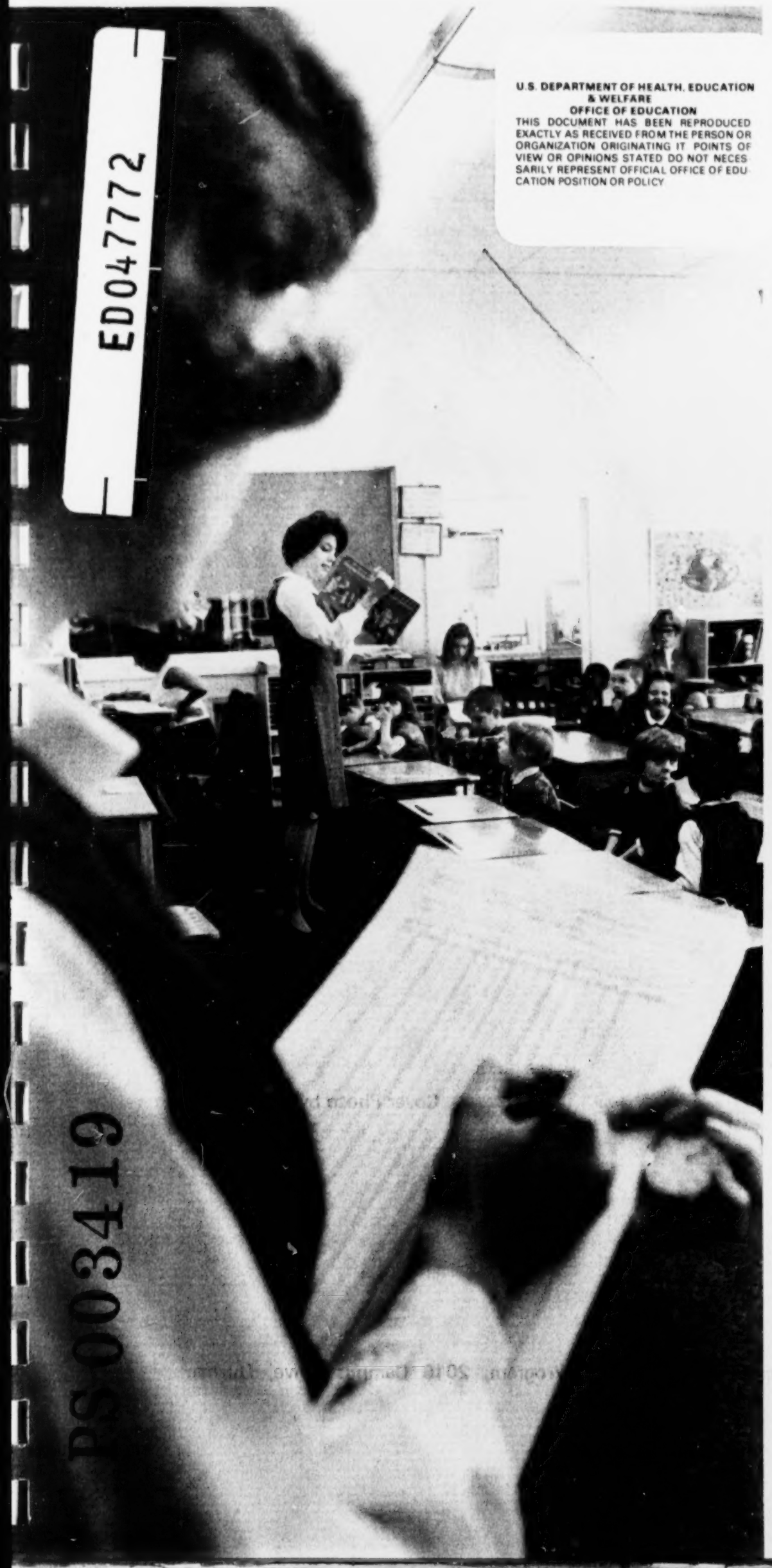

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Field Studies of Social Reinforcement in a Preschool

Florence R. Harris

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Florence Harris is Director of the Developmental Psychology Laboratory Preschool at the University of Washington, Seattle. As teacher, researcher, lecturer and consultant on preschool programs she has become one of the highly effective advocates of improved child development practices in educational settings employing basic learning principles. She successfully incorporates both the "hard nosed" rigor of the experimentalist and the tender, informed understanding of the child development specialist into her program activities.

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FIELD STUDIES OF SOCIAL REINFORCEMENT IN A PRESCHOOL[1]

Over the past five years our staff has been studying the use of adult social reinforcement to modify problem behaviors of individual children in the Laboratory Preschool. By "problem" I mean behaviors that are of concern to both teachers and parents because they seem to impede the child's development. As a result of these studies, we are convinced that among the most useful tools a teacher can acquire are skills in using reinforcement principles. Such skills require knowledge of operant learning theory, familiarity with objective observation and recording of behavior, practice in defining goals and planning (programming) successive steps toward those goals, and control of one's own responses.

Reinforcement principles, as you know, are based on the premise that most behavior is controlled by its immediate consequences. Any consequence which consistently leads to increase in the rate of the immediately preceding behavior is called a positive reinforcer. Now an almost inevitable consequence of a child's behavior, and particularly of his "problem behavior," is adult attention. "Attention" is defined as going to the child and smiling at, talking to, or touching him, or any combination of these behaviors. This consequence, moreover, unlike most other consequences, is completely under the control of the adult. Also unlike most other consequences, it is continuously and readily available to teachers. Giving or withholding attention requires only that the teacher be present. It seemed, therefore, both necessary and convenient that we study the effects on child behavior of teacher attention, to determine whether it functioned as a reinforcer, in accordance with reinforcement principles. If it did, then by controlling their own attending behaviors teachers might help children who showed problems. Teachers would simply need to (1) give attention to behaviors considered desirable and (2) withhold or withdraw attention from behaviors considered undesirable.

Although the process proved to be far from simple, we have systematically studied effects of adult attention on many kinds of problems, from behavior deficits such as extreme passivity, excessive isolate behavior, regressed crawling, and lack of speech, to behavior excesses such as hyperactivity, excessive aggression, and excessive crying. Brief descriptions of some of these studies will familiarize you with our procedures and the nature of our findings.

Operant Cryer Studied

Bill was a sturdy, handsome, capable four-year-old who morning after morning did far more crying than any other child in the group. The first few weeks of school passed with no diminution in Bill's screams and tears, though most children adjusted easily. If anything, the tears increased. After several weeks of dashing to "save" Bill, teachers noted that (1) the crying was usually set off by some very minor bump or frustration, (2) that rarely did he get really hurt, *never* seriously, (3) that he often cast a quick glance around before emitting his piercing cries, increasing the volume if no one came at once, and (4) that at least one teacher, sometimes all three, usually hurried to rescue him from the current disaster and stayed to wipe his tears and to comfort him. In other words, crying was getting a great deal of adult attention. It was decided to study systematic application of adult social reinforcement to help Bill acquire more constructive ways of dealing with minor hurts and rebuffs.

Before starting any procedures, teachers used pocket counters to determine the rate, or operant level, of the crying behavior. Over a period of ten days they found that Bill averaged about eight all-out crying episodes per morning.

Teachers then planned and instituted reinforcement procedures; that is, they ignored Bill completely whenever he burst out crying, remaining busy elsewhere until his crying had completely ceased. Concurrently, whenever he made the slightest effort to resolve his problems verbally or physically, they went to him immediately and gave appreciative attention. Had he genuinely hurt himself at any time, of course, a teacher would have gone to him at once and given help.

Figure 1 shows a cumulative graph of Bill's crying episodes. The black circles indicate the average rate of eight episodes for each of the ten days of baseline. The open circles show what happened under social reinforcement procedures: within five days the number of crying episodes per day had dwindled to one. During all of the next five days there was only one crying episode.

Reinforcement Pattern Reversed

At this point a test procedure was necessary to ascertain whether the changes had actually been brought about by the social reinforcement procedures used, and not by some other variable, such as the weather. The test procedure consisted of reversing the first pattern of differential reinforcement. Teachers ignored all of Bill's constructive responses to problems which arose, but gave immediate and continuous attention (reinforcement) for any crying behavior. Since at this time there was practically no crying to attend to, teachers had to develop it from minimal signs of distress. They watched for times when Bill frowned or screwed up his face over some bump. At once a teacher was there commiserating, patting, and delivering solicitude in any appropriate fashion. As you can see by the second series of black circles, teachers succeeded in shaping up crying again, but not quite in the strength obtained during baseline (about six episodes per day, on the average). Presumably, Bill had begun to find more constructive behaviors reinforcing in themselves.

As soon as the data showed that the behavior change was indeed a function of contingent adult attention, the teachers returned to the original pattern of differential reinforcement. The crying dropped out almost immediately and did not recur as a problem during the rest of the school year.

This study of "an operant cryer", done by Betty Hart, Eileen Allen, Joan Buell, Montrose Wolf and myself, clearly illustrates our basic procedures which follow observing and defining the behavior problem, discussing it with the child's

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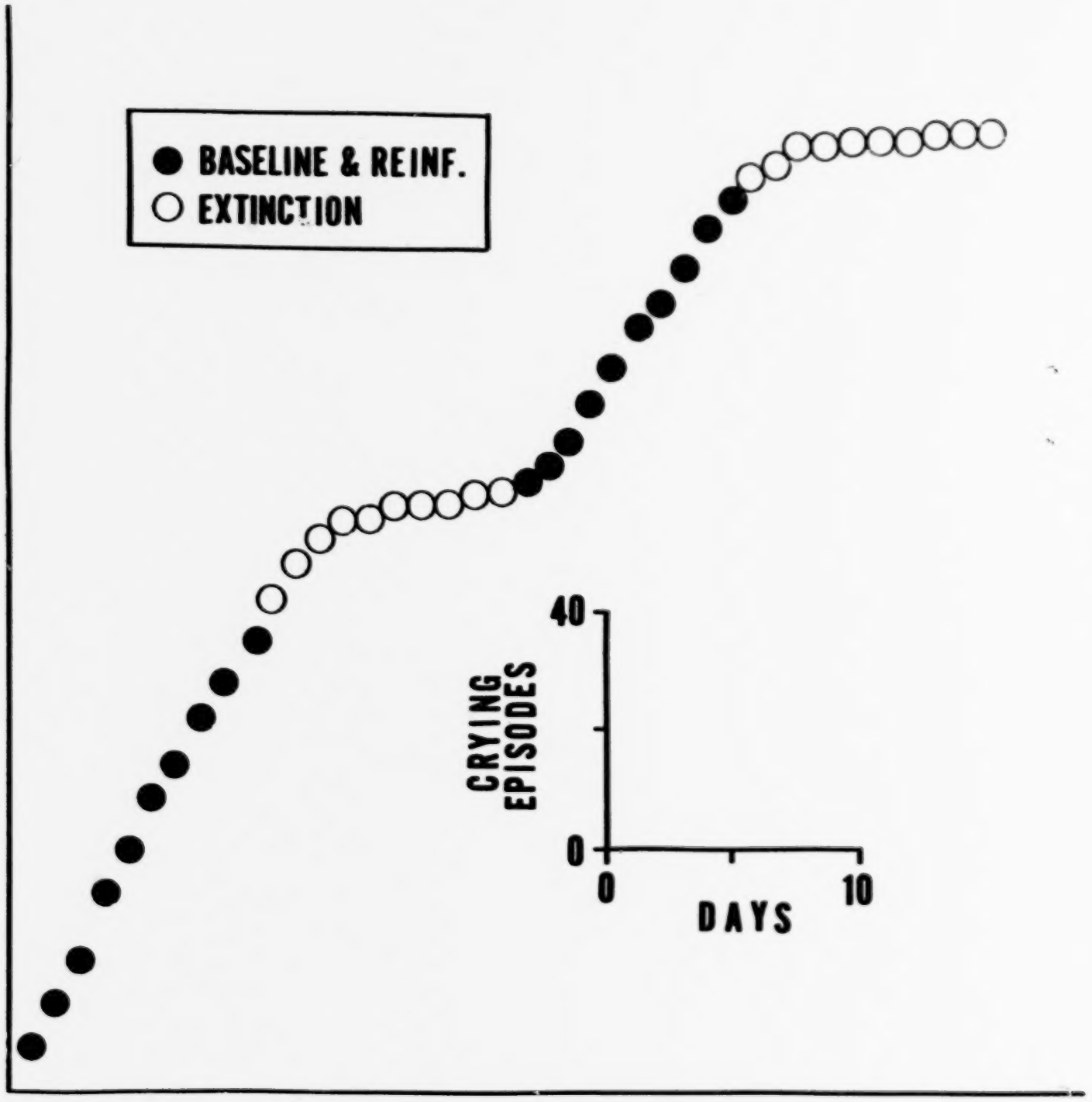

FIGURE 1: "BILL"

parents and reaching agreement that a study should be made. Our first procedure, then, was to secure precise data on the prevailing, or operant, rate of the behavior. Second came differential reinforcement of the behavior, with appreciative attention given to all desirable responses and no attention to the defined problem behavior. Third, if the child's behavior altered significantly in the desired direction, teachers tested whether their attention was actually the significant factor producing change. They reversed procedures, giving no attention to the desirable responses, but continuous attention to the problem behavior. Teachers had to develop the problem behavior again by attending first to very faint approximations to it, then to stronger signs and finally to "cries audible more than three feet away," the criterion for the problem behavior. (It seems highly likely that a similar procedure produced the problem in the first place.) Recurrence of the problem behavior under these conditions indicated a high probability that the attending behavior of adults was the causative factor in both eliminating and in building the behavior.

When a test of the significant variable had given reasonably conclusive information, the fourth step was instituted: teachers again attended continuously to the desired behavior and ignored the undesirable behavior. A fifth step involved slowly reducing the amount of attention given immediately consequent upon desirable behavior, until the child was getting the daily amount usual in our school situation. Presumably desirable behavior, or successful behavior, draws reinforcement from many other sources, both social (peers and other adults) and intrinsic (accomplishment and success).

Parents were, of course, kept informed of the progress of any study. Usually they were delightedly aware of changes that occurred and inaugurated the more helpful attending behaviors at home.

Mark's Passivity Hampered Development

The technique of building a new behavior out of the closest approximation to it that the child happens to emit was demonstrated in another early study, this one done by Margaret Johnston, Susan Kelley, Montrose Wolf, and myself. The subject was a three-year-old boy, Mark, whose extreme passivity seemed to hamper his development of skills in every area of growth, social and intellectual as well as motor. Despite traditional teacher efforts to stimulate and encourage him into activity, records taken toward the end of winter quarter showed that his lethargic and aimless behavior was not diminishing. Indeed, it was increasing. The records also showed that his behavior, while repelling or failing to hold playmates, was drawing a good deal of teacher attention. It was decided, therefore, to study whether Mark could be helped to become more vigorous, and thus better able to participate in the group activities, by giving teacher attention systematically in accordance with reinforcement principles.

Now, vigorous activity is very difficult to define precisely in behavioral terms. The staff agreed, however, that use of a piece of yard equipment called a "climbing frame" required vigorous activity and could be readily and reliably observed and recorded. Therefore, use of the climbing frame by Mark was designated the goal behavior. The criterion for recording its occurrence was that he be touching the apparatus.

Before teachers made any change in their guidance procedures, an observer was assigned to record the operant level of Mark's climbing frame behavior. She also noted his use of other climbing equipment and the occasions on which he received teacher attention. Using a clipboard, a stopwatch, a code and a special form, the observer recorded these behaviors in 10-second intervals for eight days. In Figure 2, baseline, it can be seen that Mark's climbing frame behavior was practically zero. Moreover, he used other climbing equipment less than 5% of the outdoor play time. The data also indicated that Mark spent about 75% of the time in sedentary pursuits and about 25% in wandering about or simply standing. Furthermore, for almost 40% of the time, teachers were giving him attention such as suggesting activities, talking about what children were doing, and in any way encouraging him to play. Since reliability measures were taken on climbing behaviors only, the other behaviors, while considered by the staff to be reasonably accurately recorded, were not graphed as data.

Having secured a clear picture of Mark's ongoing behaviors, teachers inaugurated reinforcement procedures. Teacher attention was to be given to Mark as soon as and for as long as he touched the climbing frame. Immediately upon cessation of climbing frame behavior, the teacher was to withdraw her attention and occupy herself with other duties. One of the two teachers was designated the "reinforcer teacher." She carried primary responsibility for seeing that contingencies for reinforcement were immediately and precisely met.

Since there was practically no climbing frame behavior to attend to, the teacher had to develop it out of the behavior Mark already emitted: an occasional lackadaisical wandering down a nearby cement walk. Stationing herself beside the climbing frame, she busied herself until Mark wandered down the walk to a point closest to the frame. Then she turned to him, spoke, and remained smilingly attentive so long as he paused in that spot or came closer. When he moved on, she immediately turned back to her work with other things. The next time Mark came closer and paused longer. Soon he was not reinforced until he touched the frame. He got on the frame and began climbing on the first day. By the third day of reinforcement, climbing frame behavior had markedly increased. On the ninth day (Day 18), Mark spent more than 60% of the play period using the climbing frame.

Although the data do not show the vigor of his play, teachers reported that he was in almost constant motion on Days 17 and 18, having seemingly overcome the stiffness that his mother reported had developed over Days 11 and 12. The reinforcer teacher was, of course, giving continuous social reinforcement so long as he remained on the climbing frame.

In order to determine whether the new behavior was indeed a result of the social reinforcement, contingencies for reinforcement were reversed on Day 19. Teacher attention was withheld or withdrawn the moment Mark touched the climbing frame. But he was given attention as soon as he engaged in any other activity. For two days he spent frequent brief periods on the climbing frame. Then that behavior dropped to zero and remained very low for the rest of the reversal period. Mark engaged actively in many other forms of outdoor play, however, including use of other climbers, easel painting and block building. During these activities, of course, he received continuous adult reinforcement. The data

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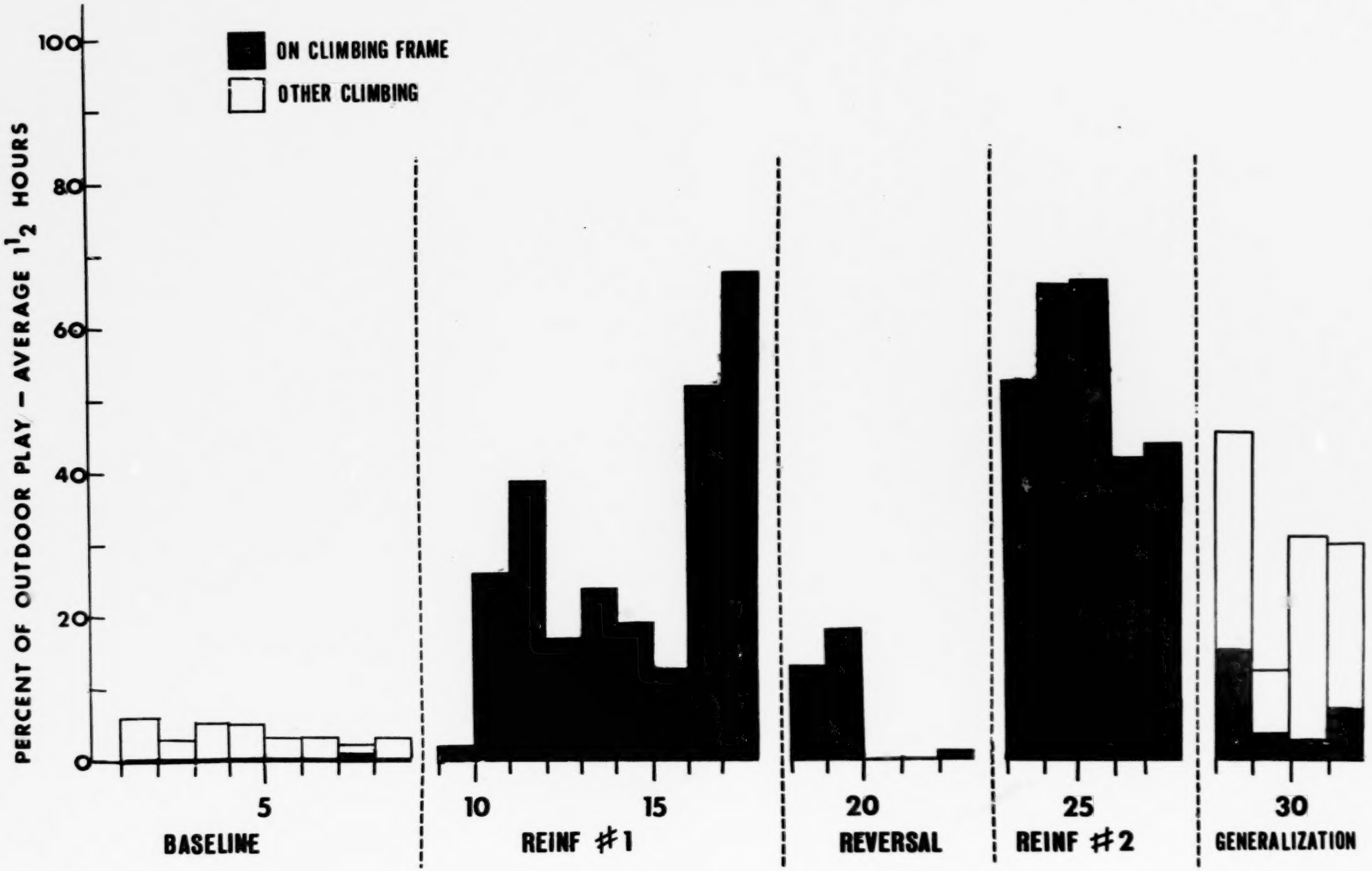

FIGURE 2: "MARK"

were considered sufficient proof that changes in his behavior were indeed due to the adult attention he received.

On Day 24, therefore, reinforcement of climbing behavior was again instituted. The behavior reconditioned very rapidly, rising at once to over 50% of the play time. Since it remained in strength from day to day, the staff decided that their objective for Mark had been achieved and an attempt was made to generalize the behavior through gradually reducing the amount of reinforcement given to climbing frame behavior. Both teachers also began to reinforce other kinds of play behavior, particularly climbing activities. They made an effort not to attend to the old, passive behavior if it occurred. They reported, too, that Mark's social play had increased.

Post checks made the following year showed that Mark maintained his vigorous play behavior, spending about half of his outdoor play time in spontaneous and skilled use of the varied pieces of climbing apparatus. Presumably, vigorous activity had come under the control of other reinforcers than teacher attention alone.

Teachers hearing accounts of our studies often question whether the reversal procedure, however necessary experimentally, is not detrimental in some way to the child. We had the same concern about it in the earliest studies we did, watching particularly for any signs in the child's behavior that the procedure was damaging. Not one such sign have we found. Indeed, the climber study, as well as the many others in which we have used reversals, has led us to think that the procedure may actually be beneficial to a child. For example, we have noted that, following a reversal, desirable behaviors returned in even greater strength than previously. We also have evidence that a reversal may help the child to generalize the desirable behaviors. In the climbing frame study, for example, Mark began during reversal to use actively and purposefully for the first time such materials as easel paint, finger paint and blocks.

In the course of the climbing frame study and others it was noted that, while teacher efforts concentrated on modification of one behavior, other behaviors also changed. For example, as Mark climbed, he played and talked with children who came to join in the fun. Social and verbal behaviors increased along with the motor behavior, suggesting that classes of behaviors might be functionally related. This matter was investigated two years later in a second study of the modification of passive behavior. This study was conducted by Joan Buell, Patricia Stoddard, Donald Baer and myself.

Gross Motor Skills Improved

The subject, three-year-old Polly, was exceedingly passive and silent, interacting with no one. Traditional teacher efforts to get her to participate in play had no success. Since it was considered that primarily she needed to become more active, teachers decided to study use of reinforcement principles to help her gain gross motor skills.

As the baseline data show (Figure 3,A), Polly scarcely touched any of the active outdoor equipment, even after several weeks of school. Section B, 1 and 2, shows the initial reinforcement period.

In this study, instead of slowly getting the child to a piece of climbing equipment through reinforcement of her successively coming closer to it (through successive approximations), the reinforcing teacher tried speeding the process by lifting Polly onto a piece of equipment and then staying close and enthusiastically reinforcing her so long as she stayed on it. The moment she climbed off, the teacher turned to other duties. Each morning for nine successive mornings (see B, 1) the teacher placed Polly on a different piece of climbing equipment. She did this only once for each piece. Thereafter, whenever Polly touched that piece of equipment the teacher at once came to reinforce her with verbal and tactual appreciation and any necessary help. After the ninth day, all such cuing was terminated, but reinforcement continued as before. As you see in B, 2, climbing dropped slightly when cuing ceased but soon recovered its previous rate. Section C shows an inadvertent reversal occasioned, presumably, by two events: a long holiday season between B and C and the absence during C of the reinforcer teacher through illness. Reinforcement during this first week after vacation was imprecise and lean. When the reinforcer teacher returned (D) and reinstituted precise contingencies, climbing behavior at once rose and remained stable. Section E shows the results of the intentional reversal of reinforcement contingencies and Section F the return to reinforcement of desired behavior.

While these data were being secured, the observer was also recording information on the several other parameters of Polly's behavior: her touching of others, speaking to others, the types of play she engaged in and some regressed behaviors defined and designated "baby behaviors." As you can see in Figure 4, all of these behaviors rose irregularly throughout the course of the study, except for baby behavior, which diminished. In no case, however, did a reversal observably alter the rate of any one of these behaviors. Moreover, in this study there were practically two reversals. Therefore, the evidence strongly suggests that no conclusion can be drawn regarding relations between the several kinds of behavior recorded. All we can say is that in the work we have done to date, although concurrent changes in several behaviors have been noted, we have found no evidence of a functional relation between one class of behavior and another.

Systematic Attention Modified Behavior

In reporting early studies we often heard this remark: "Of course the child's behavior changed. Look at all the attention he was getting!" The idea that the amount of adult attention makes significant differences in child behavior also underlies advice often given to parents: "You just need to give him more time and attention." An occasion arose for us to examine this assumption in a study done by Betty Hart, Nancy Reynolds, Eleanor Brawley, Donald Baer and myself.

The subject, Mary, was a five-year-old child who day after day engaged almost exclusively in solitary pursuits. She spent much time playing with small toy animals, telling them long stories and caressing them. Whenever children approached her, however, she quickly alienated them with such "snide" remarks as, "You don't know how to do it . . . Yours is no good . . . Mine is better . . . Go Away!" Teachers tried by all the usual methods to help Mary become more friendly. But they, too, frequently met with such things as "accidental" spills of materials, reckless behavior in high places, dawdling, or being greeted with "bathroom" talk or an order to go away. It was finally decided to study whether application of reinforcement principles could improve Mary's social behaviors.

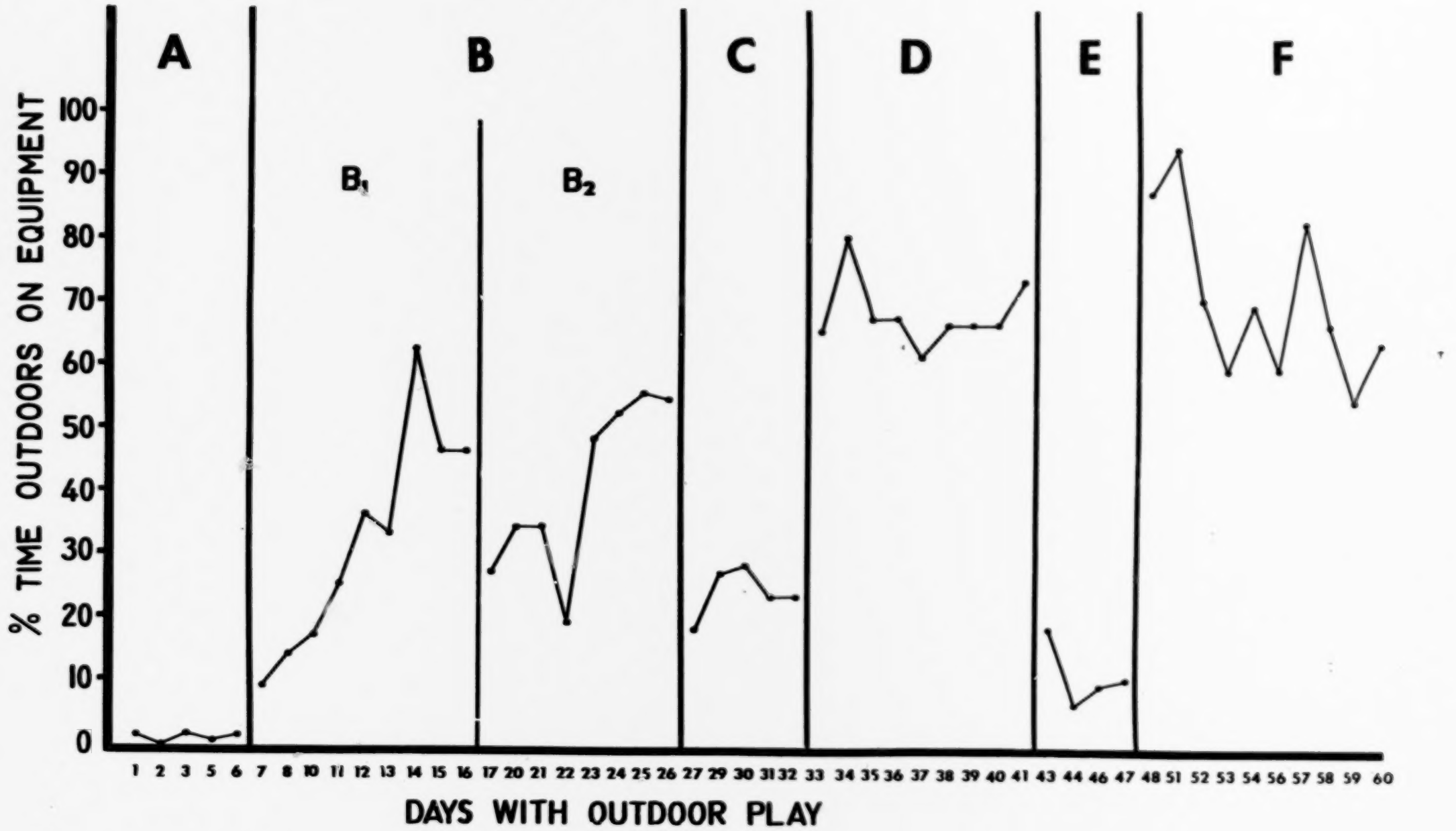

FIGURE 3: "POLLY"

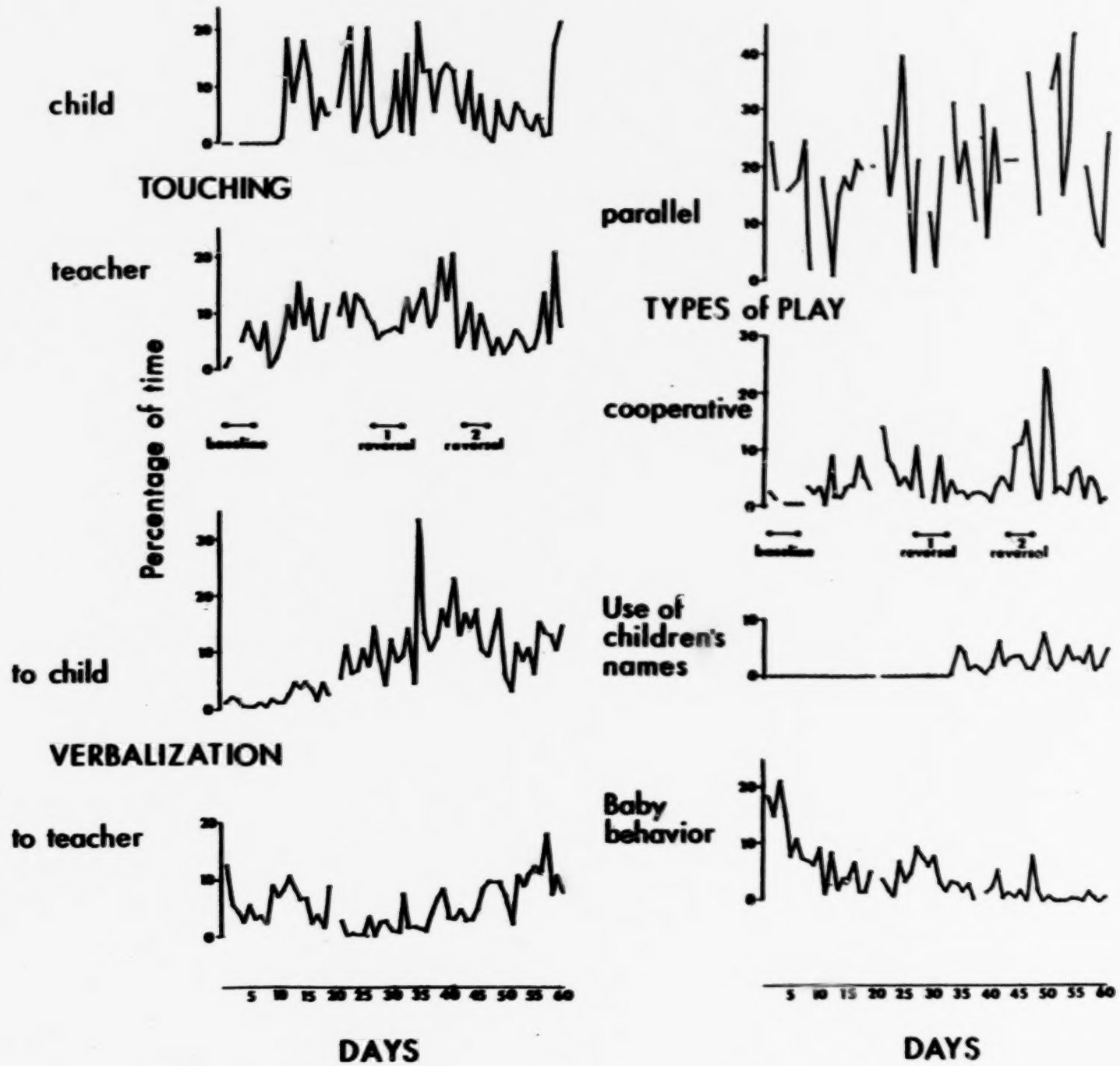

FIGURE 4: "POLLY"

Perusal of the baseline records of Mary's behavior (see Figure 5) showed that, while she usually played close to children (proximity was defined as within 3 feet) she engaged in almost no cooperative play. The records also showed that she was getting very little attention from adults. Presumably she had become as aversive to them as to the children.

The staff decided, therefore, to begin this study by simply increasing the amount of teacher attention, without making it contingent on any specific behavior. Although adult attention was defined as verbalization and touching, and only these were recorded, a teacher actually remained physically near Mary through most of the afternoons. Days 11 through 17 show the period of high "non-contingent" social reinforcement. As you can see, cooperative play remained very low, although proximity to children increased slightly. Obviously, a greater amount of teacher attention did not bring about any significant behavior change.

Contingencies for receiving attention were then instituted. A teacher went to Mary and verbalized to her or touched her, only when she engaged in cooperative play with children. Since cooperative play was at first practically non-existent, teachers cued such behavior for seven days. Cuing consisted of giving another child something to take or to tell to Mary that might start some activity together (e.g., cups for a doll tea party or a request to come in for a snack). The teacher accompanied the child and reinforced the two children as long as interaction continued. Adult reinforcement during this period dropped to no more than that given during baseline. Nevetheless, cooperative play increased markedly.

The reversal procedure in this study was a return, not to baseline conditions, but to the heavy, non-contingent adult attending maintained during the previous non-contingent period. The data show that Mary's cooperative play behavior immediately fell to a very low rate, in spite of increased adult attention.

When adult attention was again made contingent upon cooperative play, interaction with children again rose. The higher rate was maintained surprisingly well, even when teachers attempted what they considered to be too rapid a generalization, because of the close of school. Teachers also reported that during the course of the study, Mary's behavior changed qualitatively in desirable directions: the negative verbalizations to children and teachers became very rare. Caressing of toys and talking to herself dropped out completely, and her play became less sedentary. All in all, the noxious aspects of her play diminished considerably. Mary became a much more rewarding child in many relationships. This study strongly suggests that it is not the *amount* of adult attention but the precision with which contingencies for attention are maintained that brings about behavior change.

Cuing Maintained Precise Contingencies

The maintenance of precise contingencies is not an easy matter. If the problem and the staffing are such that we can do so, we assign one teacher to carry major responsibility for seeing that reinforcement is given or withdrawn immediately, in accordance with the specified procedure. The other teachers, of course, know the contingencies in force and behave accordingly if occasion arises. If there is not a designated "reinforcer teacher," then each teacher carries full responsibility when the subject child is near her. In the cryer study, for example, each teacher had to be responsible, but no difficulties arose since everyone at once knew when a cry occurred.

In a study of hitting behaviors, all three teachers again were responsible. The research design involved extinguishing (ignoring) hard hits, while maintaining (attending to) soft hits and disruptive behaviors. Teachers had difficulty at once. First, they found it difficult at times to discriminate between hard and soft hits. Second, the subject child had a way of running off just as soon as he hit someone. Frequently, he ran right around a corner to a second teacher who greeted him warmly, not knowing that she was reinforcing a "hard hit."

Each day the supervising psychologist brought the morning's data to the teacher's noon staff meeting. He showed the evidence that, far from extinguishing hard hits, the teachers were actually putting them on an excellent schedule for maintaining them indefinitely: that is, they ignored them most of the time, but occasionally and on an irregular schedule they reinforced them. I do not recall any learning experience that was more powerful or more painful for everyone involved.

To help all the teachers maintain precise contingencies, the observer was asked to provide a cue. She was given a red flashlight. As soon as the subject child emitted a "hard hit," the observer placed the flashlight on top of her clipboard clamp for two minutes. While the flashlight remained there, no one was to attend to the subject child. The observer then replaced the flashlight underneath her clipboard and the subject was again "reinforceable." This cuing resolved the problem. Teachers could glance at the observer before approaching the subject, and thus maintain the necessary reinforcing behavior. However, time had unfortunately run out. For the few remaining days of school, all classes of aggressive behavior were put on extinction. Under this contingency they rapidly diminished to a very satisfactory low rate. Teachers and parents were delighted over the child's improved behaviors. Teachers were disappointed, however, over having "lost" a study, since there was no time to conduct a reversal for the necessary testing procedure. Various kinds of cuing devices—lights, electronic equipment—have since been effectively used in studies in which adults could not readily discriminate when to attend to the subject child.

Social Reinforcement Extinguished Aggression

A later study of aggressive behavior (by Allen, Reynolds, Brawley, Harris and Baer) involved two children, both bright, capable four-year-old boys. These two were wonderful boys, gratifyingly creative and constructive—so long as they were apart. Together, they were dynamite! And the school year was scarcely well started before they were together through every minute of the morning, tearing about the yard, stepping on other people's play materials, knocking over paints and blocks, punching, pushing, disrupting (ostensibly, of course, by "accident"), using bathroom language, calling names, and generally defying both children and adults. Using every traditional teaching method from suggest to scold, teachers could get them to participate in constructive learning activity, or to separate, only briefly if at all.

Although prospects for success in using social reinforcement to separate the two boys looked dim, we decided to try. First, two observers were assigned, one to each child, to get baseline data on the operant level of the time each spent with the other and the time each spent with other children. Since the two graphs turned out to be practically identical, Figure 6

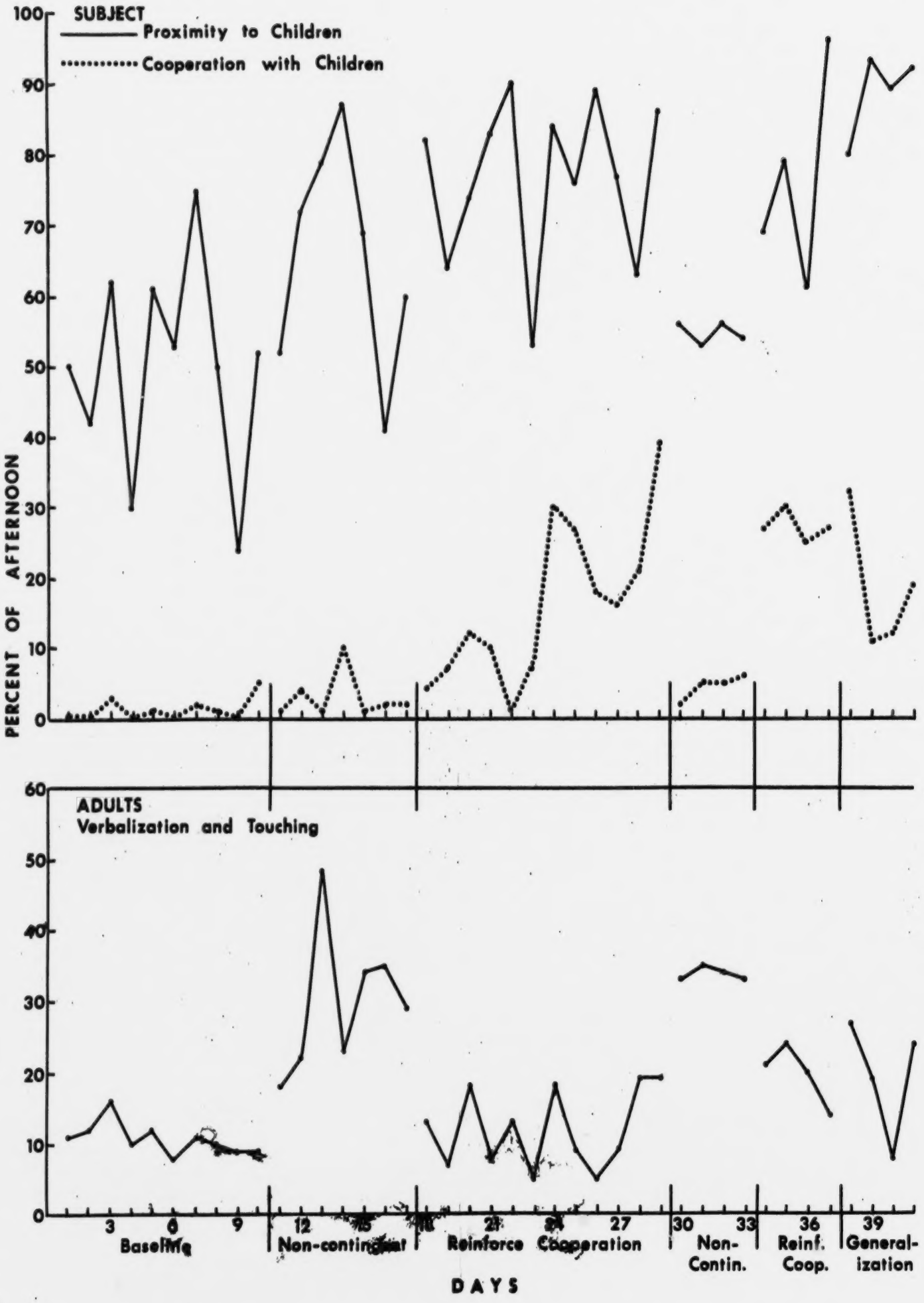

FIGURE 5: "MARY"

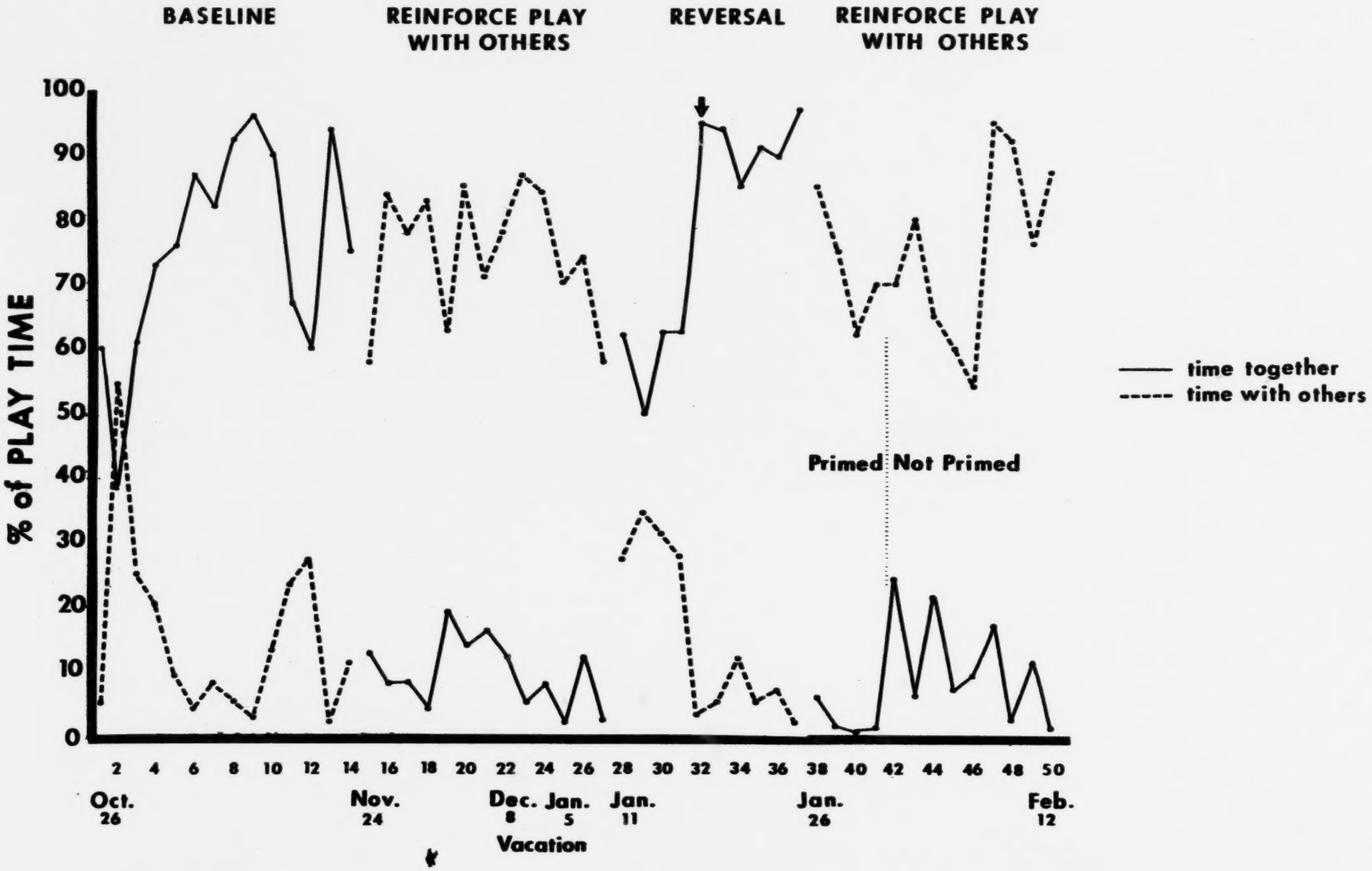

FIGURE 6 :"CHILD B"

illustrates what occurred in both cases. As you can see, Child B spent an average of about 75% of each morning with Child A. Concurrently, he spent about 10% of the morning with some other child. Note the unusual data for the second day of baseline. On this day occurred one of the rare instances of a quarrel between the two boys and they stayed apart practically the whole morning. By the next day the rupture had healed, however, and the two continued their demolition and defiance as usual.

Beginning on the fifteenth day, a teacher was assigned to each boy. Each teacher greeted her child the moment he arrived and, moving with him, took appreciative interest in any activity he selected, attempting to include nearby children in the activity, if possible. Each teacher continued such social reinforcement so long as the two boys remained apart. If they came together, the teachers left and all adults ignored them until they again separated. Although initially teachers were dubious about being able to keep the boys separated, the data show how highly successful they were. Each boy's play with other children at once increased to about 75% of each morning, while play together decreased to about 10% of the morning. And since play with other children, you will recall, was usually gratifyingly creative and constructive, desirable play patterns were getting continuous and appreciative teacher attention.

After thirteen days of reinforcing play with others, the teachers tested the strength of the social variable by reversing their procedures. So long as the two boys were together, the teachers now gave full attention. As soon as they separated to play alone or with others, the teachers turned to other duties. Within three days the play pattern of the two boys was completely reversed and they played together most of the time. It was evident that the social behavior of both was strongly influenced by adult reinforcement.

When the teachers once again attended only to play with others, that behavior at once recurred. Presumably, the constructive and productive aspects of play with other children was itself reinforcing. Shortly, indeed, if the two boys joined each other briefly, their play together showed none of the earlier distressing destructive-aggressive characteristics. Teachers gradually diminished their attending, to the amount usual in the situation, and from then on for the rest of the year each boy played with a variety of playmates, enjoying many friends in addition to each other, and developing social and pre-academic skills in highly desirable and obviously satisfying fashion.

"Attending Behaviors" Increased

In the area of pre-academic behaviors, a skill that seems basic to all learning is the ability to attend to a stimulus or a set of stimuli long enough to develop appropriate responses. Occasionally, however, a child enters our preschool with very limited "attending behaviors". We usually refer to such a child as a "flitter." for he seldom settles to any one activity long enough to develop constructive and creative skills. With the passage of time, such behavior becomes an increasing handicap to the child's learning.

Such a "flitter" was enrolled in the four-year-old group. Since some children show rather flighty behavior when they are first exposed to an environment rich in attractive materials and activities, it was almost mid-winter before the staff agreed that James needed special help to increase the span of his attending behavior, even though in all other respects he seemed adequately skilled. This study was done by Allen, Brawley, Reynolds, Harris and Baer.

An observer was assigned to record his behavior, noting his activities and the time he spent in each. Over five school mornings, these records showed that although occasionally James spent one, two, or three minutes with an activity, the average duration of each activity was less than one minute, and he was busy all the time.

The procedure for increasing the duration of time James spent in any activity was to make adult attention contingent solely on his spending one minute emitting "attending behavior." Attending was defined as play activity (1) with a single material such as blocks or paint, (2) in a single area such as in the sand box or at a table, or (3) in a single dramatic role such as fireman, or telephone repair man. One teacher was assigned responsibility for maintaining reinforcement contingencies.

It seemed unlikely that the teacher would be able to accurately time duration of the child's activities so she could reinforce him when—and *only* when—he had attended for precisely one minute. The observer, who timed all observations with a stopwatch, was therefore asked to provide a cue as soon as James reached criterion and was "reinforcible." She used a red flashlight, as in the uncompleted aggression study.

Figure 7 shows the progress of the study. Data were graphed in terms of the number of activity changes that occurred within successive 50-minute time units. In most instances, but not invariably, two 50-minute periods indicated one day of recording of free-play time. The more teacher-controlled activities such as group times were not recorded.

The baseline record (Stage 1) shows that James was changing activity on an average of 56 times every 50 minutes. He averaged 53 seconds per activity. Concurrently, teachers were giving him non-contingent attention about 17% of the time.

During Stage 2, the teachers gave him attention as soon as he had spent one minute in one activity, continuing to attend steadily so long as he remained in the activity. As you can see, James at once began making fewer shifts in activity, and spending longer periods with each one. The average duration of each activity rose to almost 2 minutes.

Teachers then instituted a brief reversal with reinforcement again on a non-contingent basis to check on whether adult attention was indeed causing the change. Obviously it was, as Stage 3 indicates. After four 50-minute checks, teachers returned to the reinforcement contingencies of Stage 2. During Stage 4 A, reinforcement was given immediately and continuously after James had engaged in one minute of play, and discontinued as soon as he left the activity. The average duration of each activity rose to two-and-one-half minutes.

Contingencies were then changed (Stage 4 B). The criterion for receiving teacher attention was raised to two minutes of continuous attention to the same activity. As you can see, although James' attending behavior was slightly disrupted, it soon was meeting the new criterion very acceptably. Actually, teachers noted that he often spent 15, 20, or 25 minutes in one activity. But since this sometimes involved his going to another area to get more materials or to get another child to join him in his work, each departure was recorded and treated as a change of activity although he returned to the same activity at once. For this reason, data at the close of the study

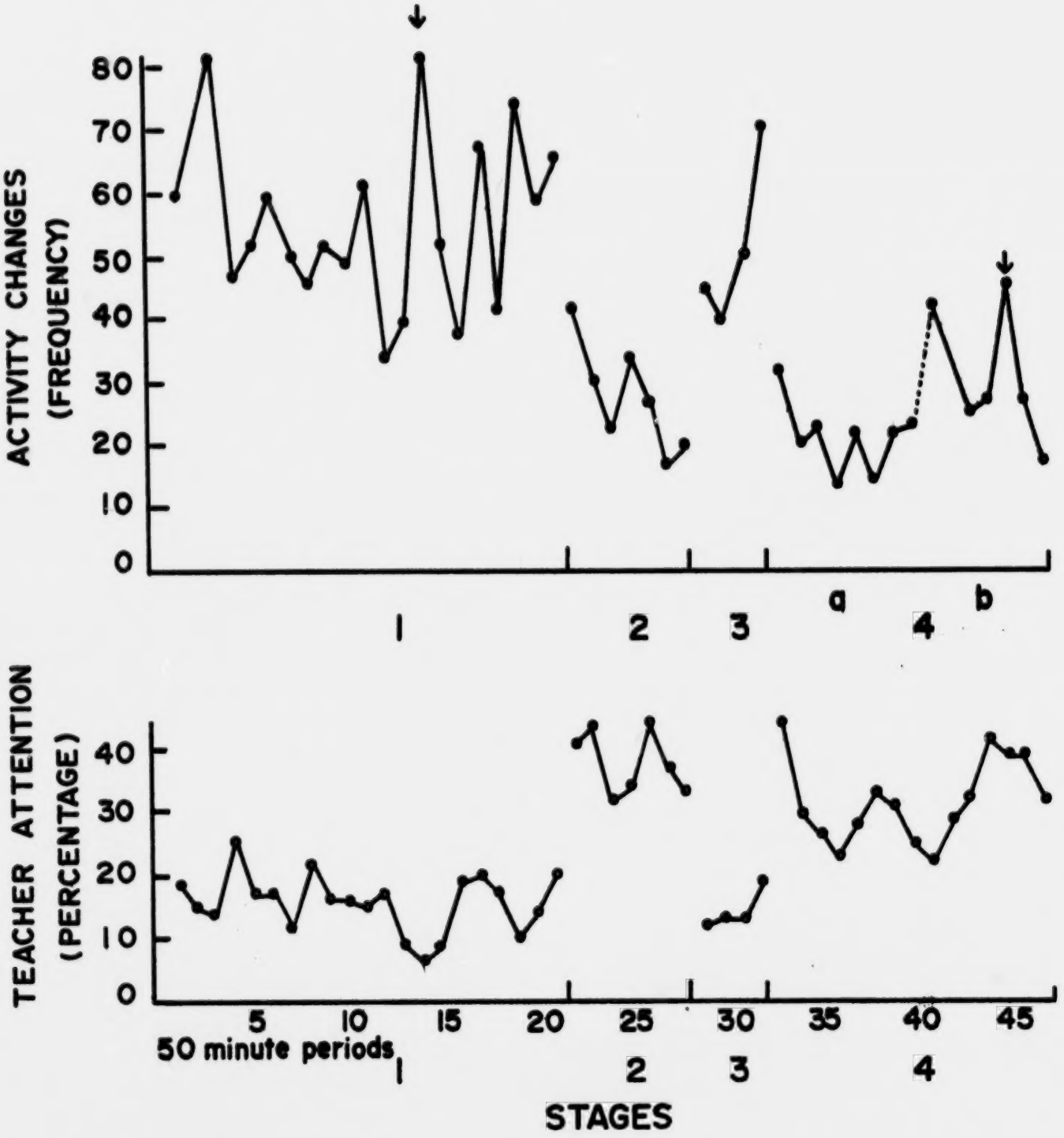

FIGURE 7: "FLITTER"

did not fully reflect the improvement teachers considered James to have made in his attending behaviors.

Note the arrows at two periods showing the highest number of activity changes within their respective stages of the study. The arrows mark days on which James' mother came for her regularly scheduled visit. No restrictions were placed on her interactions with James, since visits tend to be exciting for both parents and child. In her usual fashion she interacted steadily with him, making many suggestions that he bring her this or show her that or "settle down" to the other. She was, of course, reinforcing behavior incompatible with the attending behavior (less frequent activity changes) that teachers were trying to shape. In a way, the data on those days seem to increase the evidence that James' short attention span was due to adult social reinforcement.

Child's Silence Hindered Relationships

We have conducted studies in another area of behavior that might be considered pre-academic: that of verbal behavior. The study I shall describe focused on a four-year-old girl who had a perfect command of language but who failed to use it. The study was done by Eileen Allen, Betty Hart, Joan Buell, Montrose Wolf and myself.

Sally's excessive silence seemed to be seriously hindering her relationships with both children and adults: children eventually left her entirely alone.

Baseline data in Figure 8 showed that Sally talked very little to anyone, children or adults. They also revealed that a fair percentage of the little talking she did took place when she was off by herself. With three aspects of language behavior to work with—speech to adults, speech to children, speech in isolation or "to herself"—the staff decided to use a research design in which one speech variable at a time was reinforced. Teachers planned first to reinforce (attend to) Sally's speech to adults. Should significant increase in this one variable occur, teachers would then reinforce speech with children, while maintaining speech with adults. This design, in which one dependent variable after another was modified, made unnecessary a reversal type of test of the independent or significant variable.

As you can see, warm and intensive adult responsiveness (reinforcement) to all verbalizations to teachers rapidly increased the rate of this behavior. Talking to other children and to herself, which were not reinforced, remained at a low level. On days 20 through 28 teachers extended reinforcement to include similar attention to all of Sally's verbalizations to children. There followed a marked rise in verbal behavior with peers, while verbal behavior with adults maintained a high rate. Verbal behavior when by herself remained at a low, constant rate.

Teacher Attention Stimulated Verbalizations

This study, although not completed to the full satisfaction of the staff due to the close of the school year, was repeated in its major aspects two years later, with the addition of a reversal period following reinforcement of verbalizations to adults and a consequent increase in that behav or. Again, the subject was a capable four-year-old girl who simply did not use the language she had. Initial data secured (Figure 9, Baseline) showed that Jennifer spoke very little to either adults or children, but there was no talking when she was apart from people. Procedures were instituted that paralleled those used with Sally (the previous non-speaking child): teachers gave immediate interested attention whenever she spoke to them, continuing until she stopped responding verbally. Then they at once turned to other things or children. As Figure 8 shows, while these contingencies were in effect (Day 5 through Day 23), there was a marked rise in her verbalizations to teachers. A slight increase also was evident in her verbalizations to children, possibly this indicated a generalization effect of the increased talking. More probably, the teachers thought, it was due to the fact that a teacher and child in animated conversation tended at times to draw other children.

On Days 24 to 28 a reversal procedure clearly indicated that adult attention was the significant factor affecting Jennifer's verbal behavior. Starting with Day 29, therefore, teachers gave immediate and continuous attention to all of her verbal behavior to children. For the first seven or eight days, they also gave cues as to how she might initiate, or even respond to, verbal approaches of children. (e.g., You can tell her, "I'd like some blue paint.") Such cues were then gradually dropped, and Jennifer was reinforced only for self-initiated responses. Throughout this period, teachers held to a minimum their reinforcement of verbalizations to an adult alone, since this was now somewhat incompatible with the primary objective of verbalization to children.

The contingencies applied were obviously effective, since by the close of the study Jennifer was freely verbalizing to both children and adults, the rate to children being about twice that to adults. Both teachers and parents were highly pleased with the outcome.

As the above review of studies has indicated, reinforcement principles have proved to be effective tools for helping children modify behaviors that handicap them. Acquisition of skills in using these tools, consequently, becomes highly reinforcing to teachers and parents alike. After all, the modification of behavior is a primary function we have in common. It is stimulating to consider that by simply using systematically a behavior we already employ we may help children learn faster and with less apparent strain.

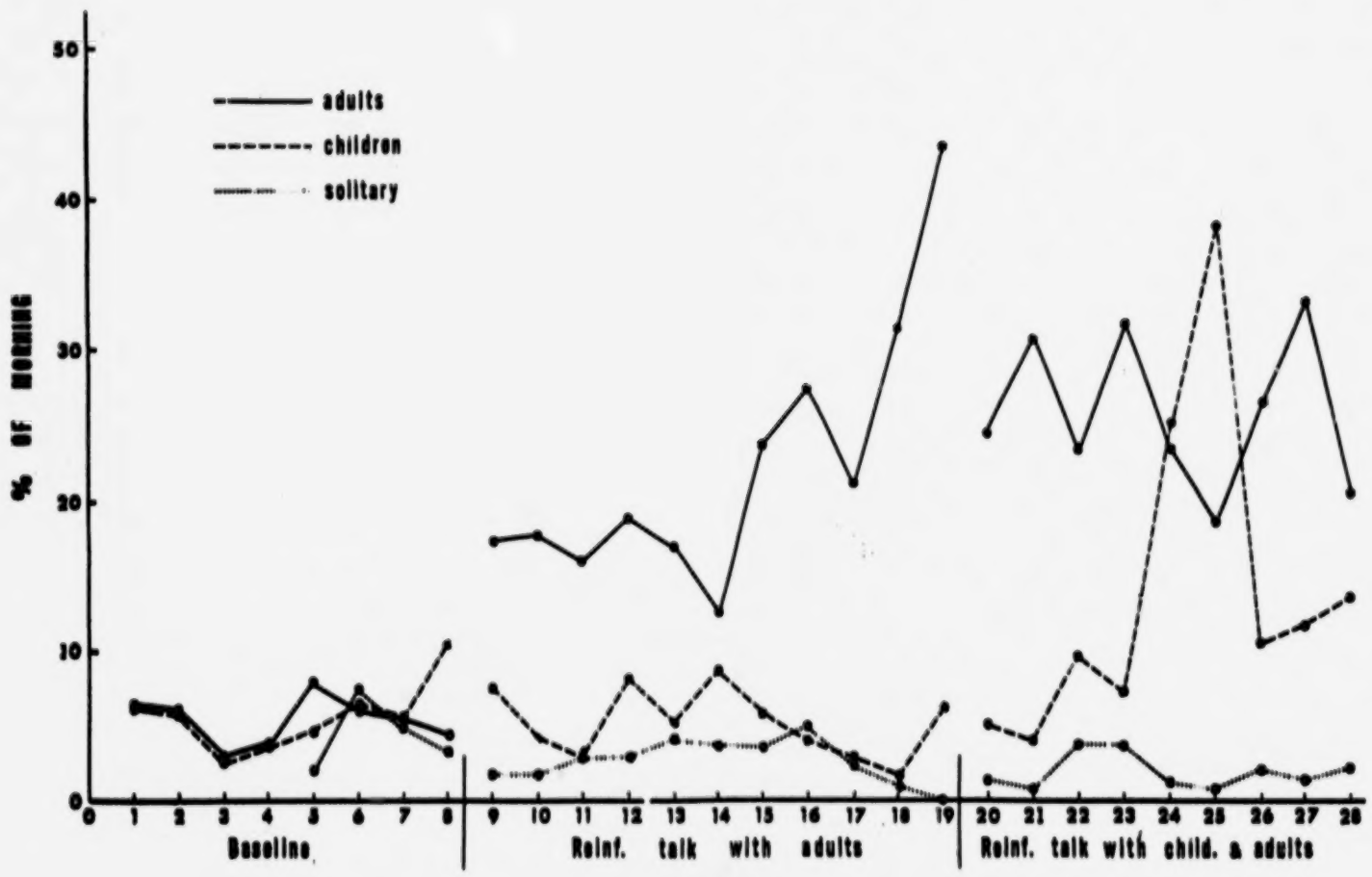

FIGURE 8: "SALLY"

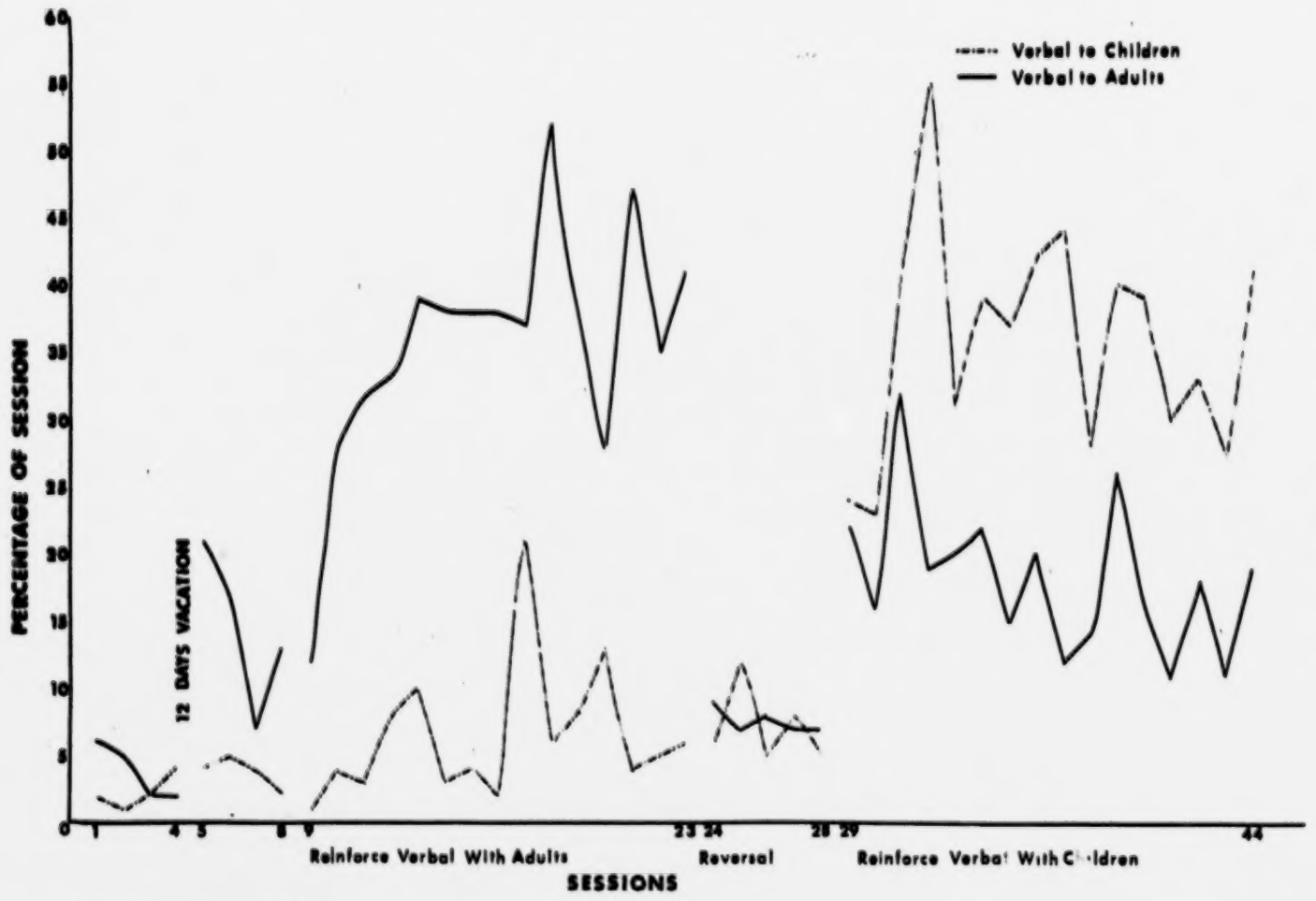

FIGURE 9: "JENNIFER"

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